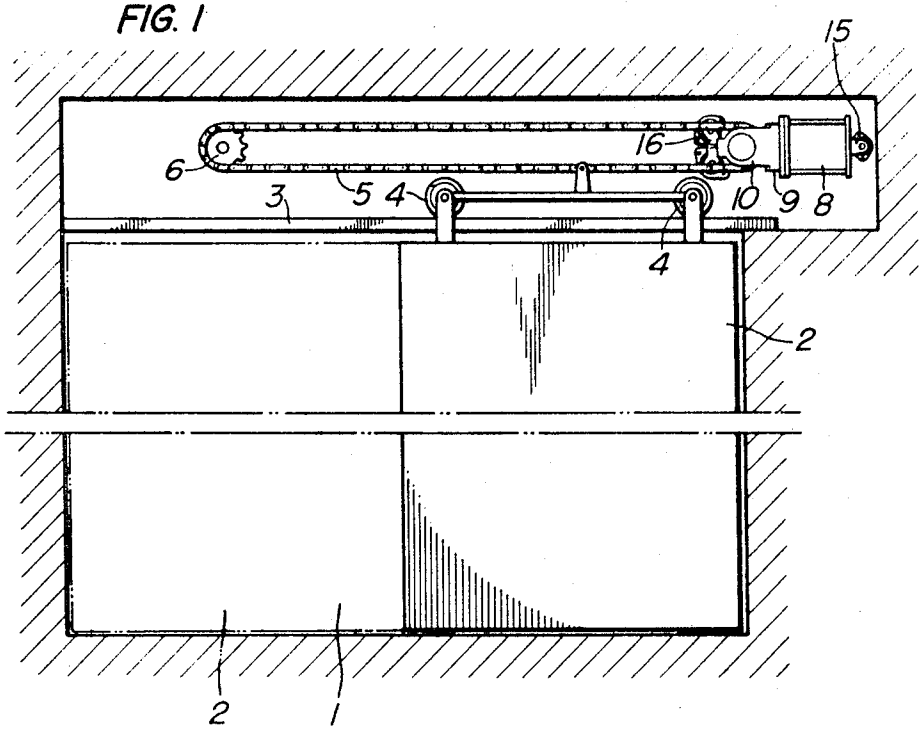
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ELECTRIC ACTUATOR FOR AUTOMATIC DOORS

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FIG. 1



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FIG. 2

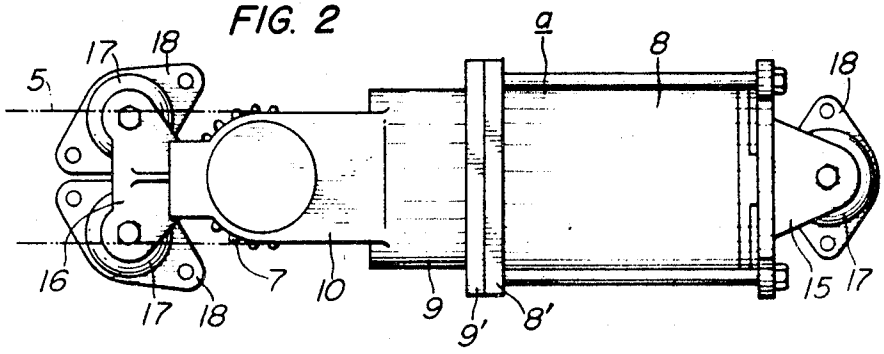


FIG. 3

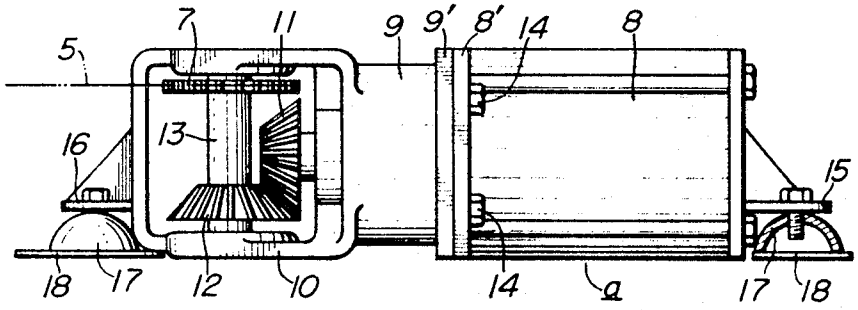
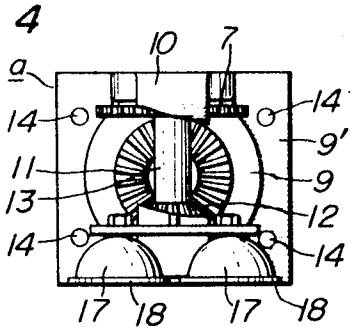


FIG. 4



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United States Patent Office 3,468,061 Patented Sept. 23, 1969

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ELECTRIC ACTUATOR FOR AUTOMATIC DOORS

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Claims priority, application Japan, Nov. 11, 1966 (utility model), 41/107,233
Int. Cl. E01f *13/00*
U.S. Cl. 49—360 1 Claim

ABSTRACT OF THE DISCLOSURE

A compact, neat and cheap electric actuator for an automatic door is provided by an integral structure of a motor, reduction gear box and a set of bevel gears which change the axis of rotation of a drive shaft arranged parallel to the wall of a building by ninety degrees so that a sprocket wheel carrying an endless chain arranged parallel to the wall and connected to a sliding door can be simply driven.

The present invention relates to an electric actuator adapted to actuate an automatically opening and closing door at an entrance and exit of a room or office.

Actuator means of the type described are required to be compact in size so as to be easily attached to the structural frame of a building adjacent to the door for which said actuator means is used, to operate in a positive manner with less vibration, and to be cheap in price and neat in appearance.

The present invention contemplates the provision of an electric actuator adapted to actuate an automatic door, which fulfills the requirements set forth above. Namely, the aforesaid requirements can be met by an electric actuator for automatic doors, which is adapted to be mounted on the wall of a building through cushion means and which comprises an electric motor, a reduction gear box and a box frame having a set of bevel gears journaled therein, all of which are combined into an integral unit, and a sprocket wheel mounted on the axis of a driven member of said set of bevel gears.

The present invention will now be described in further detail hereunder with reference to the accompanying drawings, which illustrate a preferred embodiment of the present invention and in which:

FIG. 1 is a front elevational view of an automatic door which is provided with the electric actuator of the present invention;

FIG. 2 is a front elevational view, in enlargement, of the electric actuator;

FIG. 3 is a bottom view of the electric actuator shown in FIG. 2; and

FIG. 4 is an end view of the electric actuator shown in FIG. 2.

Referring to FIG. 1, an entrance and exit **1** is closed with two door leaves **2**, one of which is operated automatically by means of the electric actuator according to the present invention. Above the entrance and exit **1** is provided a rail **3**, on which rollers **4**, carrying a door leaf **2**, rest for rolling thereon. The door leaf **2** is connected to a drive chain **5** at a portion of the frame structure thereof. The drive chain **5** is engaged around sprocket wheels **6** and **7**, of which the sprocket wheel **7** is rotatably mounted in the electric actuator, generally indicated at *a*, of the present invention so as to be driven by an electric motor **8** constituting a part of said electric actuator.

As shown in FIGS. 2 to 4 inclusive, a reduction gear box **9** is connected to the output shaft end of the electric motor **8** in coaxial relation and contains therein reduction gearing means which may be of any known type.

A box frame **10** is formed at one end of the reduction gear box integrally therewith, and a driving bevel gear **11** and a driven bevel gear **12** are journaled in said box frame in an intermeshing relation. The driving bevel gear **11** is operatively connected to the reduction gearing means in the reduction gear box **9** to be driven thereby. The axis **13** of the driven bevel gear **12** carries the sprocket wheel **7** thereon. The electric motor **8** and the reduction gear box **9** are integrated to constitute the electric actuator, with a flange **8'** at one end of the former connected fastly to a flange **9'** at one end of the latter by means of bolts **14**. The integral electric actuator is provided at the opposite ends thereof with mounting plates **15** and **16** respectively, by means of which the electric actuator is mounted on the structural frame of a building above the entrance and exit **1** through the intermediary of a vibration-proof rubber member **17** and a seat plate **18**.

When a person approaches the entrance and exit **1**, the electric motor **8** is actuated by photoelectric means or a mat-switch, not shown, and thereby the electric actuator is set in operation, opening or closing the door leaf **2** by way of the drive chain **5**.

The electric actuator according to the present invention, which, as described hereinabove, comprises the electric motor **8**, reduction gear box **9** and the box frame **10** with the bevel gears **11** and **12** journaled therein, all of which are combined into an integral unit, and the sprocket wheel **7** mounted on the axis **13** of the driven bevel gear **12** in the box frame **10**, is conveniently mounted on the structural frame of a building above the automatic door.

Moreover, according to the present invention, the direction of the driving power is changed perpendicularly through the driving bevel gear **11** and the driven bevel gear **12** intermeshing therewith. Because of this, it is possible to simplify the power transmission mechanism, to reduce the size of the entire actuator and to make the actuator mounting structure above the door small, and consequently the appearance of the actuator as mounted on the wall of a building can be improved as a whole. Furthermore, since the vibration-proof rubber member **17** is interposed between each of the mounting plates **15** and **16** of the electric actuator *a* and the structural frame of a building, the vibration which said structural frame is subjected to, can be minimized and therefore the door can be opened and closed smoothly with no objectionable noise.

What is claimed is:

1. An electric actuator for automatic sliding doors capable of being mounted adjacent said doors with the axis of rotation of the drive shaft of said actuator being parallel to the direction of motion of said doors, said actuator comprising

an electric motor, a reduction gear box, and a box frame formed into an integral unit,

said electric motor having an output shaft with a reduction gear means in said reduction gear box being operatively attached to and axially aligned with said output shaft,

a pair of meshed beveled gears constituted by a driving gear and a driven gear, said beveled gears being journaled into said box frame, the axis of one of said beveled gears being perpendicular to the axis of the other of said beveled gears, said driving gear having a shaft operatively connected to said reduction gear means and axially aligned with said output shaft of said motor,

a first sprocket means journaled into said box frame coaxially with said driven gear and having a shaft operatively connecting said first sprocket means to said driven beveled gear,

mounting means for attaching said integral unit to a wall surface adjacent said doors with said output

shaft of said motor being parallel to the direction of travel of said doors, said mounting means including a vibration damping member adapted to be placed between said mounting means and said wall surface, and

at least a second sprocket means external of said integral unit and positioned remotely from said first sprocket means for, in conjunction with said first sprocket means, carrying and driving an endless chain to which said door is operatively connected, thereby moving said door.

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PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,468,061 Dated September 23, 1969

Inventor(s) Kazuyoshi Ozaki

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Change the claimed priority date from "November 11, 1966" to read --November 21, 1966--.

SIGNED AND
SEALED

DEC 2 - 1969

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents